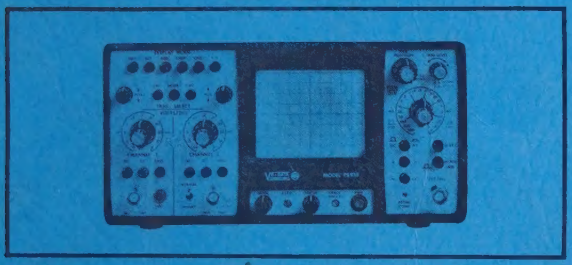
STABRO LABORATORIES

OPERATOR'S MANUAL

May 1, 1978

MODEL PS935

MINI-SCOPE



STABRO LABORATORIES, INC.
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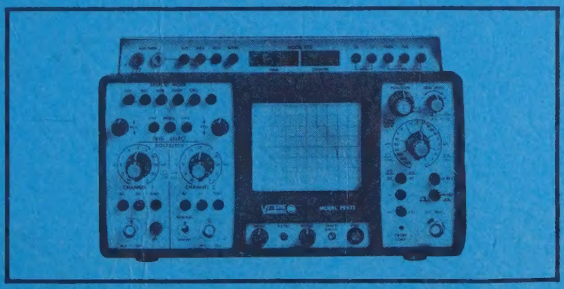
DOCUMENT CONTROL ADMINISTRATOR

MODEL PS935/975

DMM-COUNTER-MINI-SCOPE



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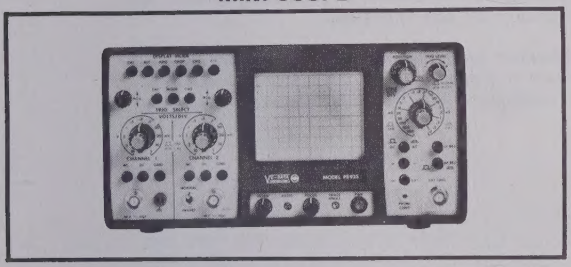

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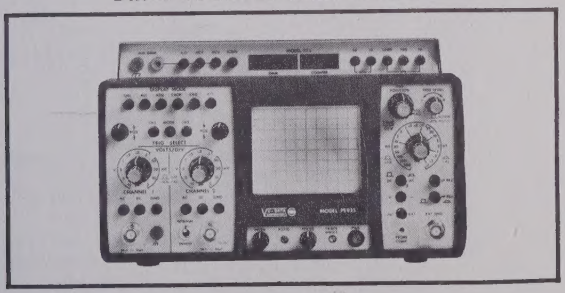

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PREFACE

This Operator's Manual is comprised of "Section III - Operation" from the Technical Manual for the Model PS935 Mini-scope and Model PS935/975 DMM-Counter-Mini-scope.

It is provided with each unit as a convenient reference for instrument operation where the complete technical manual may not be readily available or not required.

Each instrument operator is urged to review the contents of this manual to ensure a complete understanding and maximum usage of the full capabilities of each and every operating control.

SECTION III

OPERATION

NOTICE

A full-sized complete Technical Manual is available at no charge (one per instrument) and includes the following sections.....

I GENERAL DESCRIPTION
II INSTALLATION
III OPERATION
IV THEORY OF OPERATION
V MAINTENANCE
VI PARTS LIST
VII DRAWINGS

Contact Vu-data Corporation at 7170 Convoy Ct., San Diego, Ca. 92111

WARNING

When performing the power supply alignment, the instrument may be operating with the covers removed. High voltages, which could be lethal, are accessible and extreme caution should be taken. Only screwdrivers with insulated shafts should be used for setting the adjustments. The covers should be removed only for the duration of time to make the alignments. The power should be off while the covers are being removed or installed.

SECTION III

3-1. OPERATING INSTRUCTIONS

3-2. FRONT PANEL CONTROL FUNCTIONS AND CONNECTIONS

The front panel of the PS935 oscilloscope is divided into four sections. These sections are as follows: Vertical Section, CRT Controls Section, Horizontal Section, DMM/Counter Section.

3-3. VERTICAL SECTION

3-4. CHANNEL 1 CONTROLS

Refer to Fig. 3-1 for control locations.

a) Ch 1 Input — BNC connector - signal input for CH 1. Impedance is 1 Megohm paralleled by approximately 30pf. This is also the input to the DMM, when the SCOPE button on the DMM is depressed.

b) AC-DC-GND — Push-buttons - controls the signal coupling to the vertical attenuator, either in a direct (DC) or capacitive (AC) mode. The third position (GND), grounds the vertical attenuator input without grounding the input signal. With the DMM in SCOPE mode, this switch also controls the function of the DMM, AC volts in AC, DC volts in DC, and a grounded input to the DMM in GND.

NOTE: Do not exceed 400VDC + peak AC vertical input signal.

c) VOLTS/DIV — Eleven position rotary switch which selects fixed vertical deflection factors from 5mV/DIV to 10V/DIV in a 1-2-5 sequence. Vernier: Red concentric knob provides a variable deflection factor when moved out of the CAL (pushed in) position. It provides for overlapping deflection factor and extends the 10V/DIV range to approximately 25V/DIV.

d) POS — Positions the CHANNEL 1 trace vertically on the CRT, and also controls the vertical trace position in the ADD mode.

e) GND Connector — Provides a convenient place to obtain chassis ground.

3-5. CHANNEL 2 CONTROLS

a) Ch 2 Input (X-IN) — BNC Connector - signal input for Channel 2. Impedance is 1 Megohm paralleled by approximately 30pf.

b) AC-DC-GND — Push buttons - controls the signal coupling to the vertical attenuator, either in a direct (DC), or capacitive (AC) mode. The third position (GND), grounds the vertical attenuator input without grounding the vertical signal input.

NOTE: Do not exceed 400 VDC + peak AC vertical input signal.

c) VOLTS/DIV — Eleven position rotary switch which selects fixed vertical deflection factors from 5mV/DIV to 10V/DIV in a 1-2-5 sequence. Vernier: Red concentric knob provides a variable deflection factor when moved out of the CAL (pushed in) position. It provides for overlapping deflection factor and extends the 10V/DIV range to approximately 25V/DIV.

d) POS — Positions the CHANNEL 2 trace vertically on the CRT. The control is electrically centered and disabled in the ADD mode.

e) NORMAL-INVERT — Two position switch which selects zero degrees (NORMAL) or 180 degrees phase shift (INVERT) of the CHANNEL 2 input signal.

3-6. DISPLAY MODE SWITCH AND TRIGGER SELECT SWITCH

a) DISPLAY MODE SWITCH (CH1-ALT-ADD-CHOP-CH2-X-Y) — A six position push button switch which controls the mode of operation. CH 1 position selects CHANNEL 1 only. ALT provides dual trace operation with sweeps alternating between CHANNEL 1 and CHANNEL 2. In CHOP, the CHANNEL 1 and CHANNEL 2 signals are electronically switched at a 1 MHz rate to provide dual trace operation. In the ADD mode, CHANNEL 1 signal is added algebraically to CHANNEL 2 signal. Vertical positioning for this mode is provided by the CHANNEL 1 POS control. CH 2 position selects CHANNEL 2 only. In the X-Y mode, the CHANNEL 2 signal, after positioning, is routed to the horizontal amplifier. X positioning is done by CHANNEL 2 POS control.

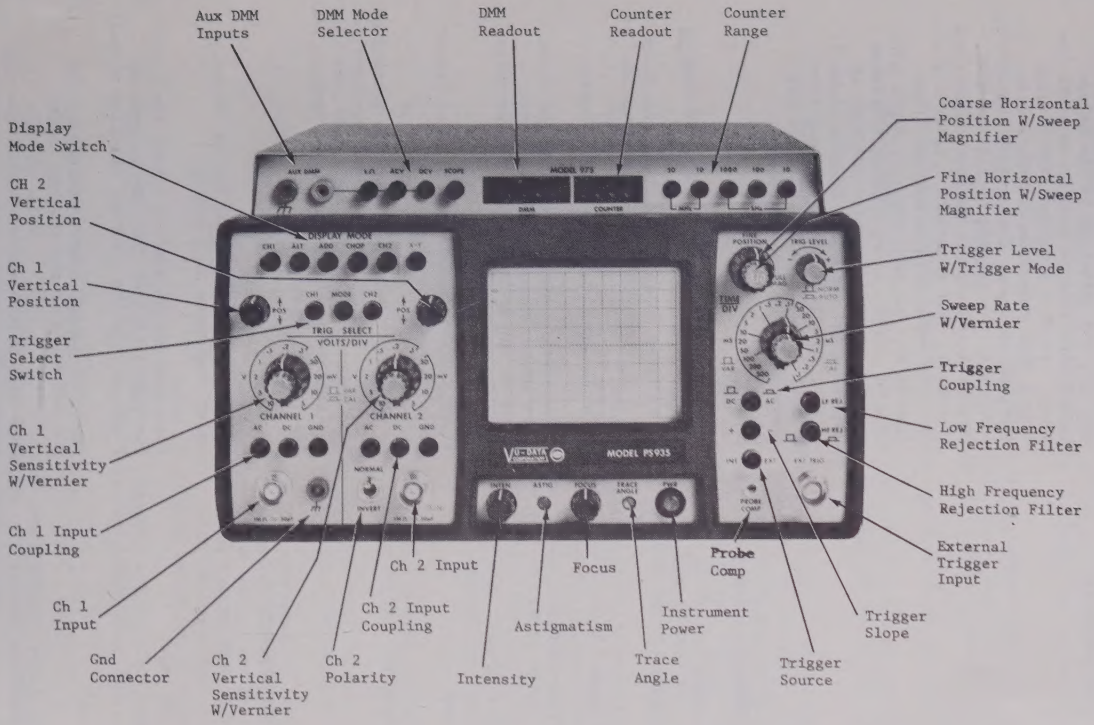

Figure 3-1. Location of Front Panel Operating Controls Model PS935/975

b) TRIG SELECT (CH1-MODE-CH2)

A three position push button switch which controls the selection of the trigger signal that will be used to initiate the sweep. In CH 1 position, the trigger signal will come from CHANNEL 1 only. In the MODE position, the trigger signal will conform to the setting of DISPLAY MODE. CH 1 position selects trigger signal from CHANNEL 1. ALT position, trigger signals will alternate between CHANNEL 1 and CHANNEL 2. ADD position, algebraic addition of CHANNEL 1 and CHANNEL 2 trigger signals. CHOP, algebraic addition of CHANNEL 1 and CHANNEL 2 trigger signals. In CH 2 position, trigger signal from CHANNEL 2 only. In X-Y, trigger and sweep generator are disabled.

3-7. CRT CONTROLS SECTION

a) INTEN — Controls the intensity of the CRT display.

b) ASTIG — Screwdriver adjustment through the front panel for control of trace astigmatism.

c) FOCUS — Controls the focus of the CRT display.

d) TRACE ANGLE — Screwdriver adjustment through the front panel which controls the horizontal angle of the trace relative to the graticule.

* e) PWR — A push-push switch for controlling the AC power to the instrument.

* A "Power On" indicator light for battery pack version. An ON-OFF-CHG, three position switch is located on the right rear side panel for the battery pack version. (See section 3-23 for battery operation.)

3-8. HORIZONTAL SECTION

a) EXT TRIG — BNC connector - external trigger signal input, impedance is 1 Megohm.

b) INT-EXT — Push-push switch used to select the trigger signal, either from the trigger BNC Input or from the internal vertical channel.

c) +/- — Push-push switch allows control of the desired slope of the trigger signal.

d) AC-DC — Push-push switch which controls the coupling of the trigger signal in either direct (DC) or capacitive (AC) coupling.

e) HF REJ — Push-push switch which inserts a single , low pass RC filter into the trigger line (pushed in) or filter is bypassed (extended).

f) LF REJ — Push-push switch which inserts a single, high pass RC filter into the trigger line (pushed in) or filter bypassed (extended).

NOTE: Both filters may be inserted for a bandpass filter.

g) TRIG LEVEL — Controls the point on the trigger signal wave form at which the horizontal sweep will start.

h) AUTO-NORM — A push-pull switch connected to the TRIGGER LEVEL control. In the NORM (extended) position, the low frequency oscillator that provides the baseline in the absence of a signal is disabled. In the AUTO (pushed in) mode, normal trigger signals will override the bright baseline oscillator at frequencies above 40 Hertz.

i) TIME/DIV — Twenty-one position rotary switch provides the calibrated sweep ranges from 100 nanosec/div to 500 millisec/div. Vernier: Red concentric knob of TIME/DIV switch slows down the sweep speed in the uncalibrated (pulled out) position, by rotating the red knob. Simply push red knob back in to return to the calibrated mode.

j) POSITION — Outside black knob controls coarse positioning of the horizontal CRT display.

k) FINE — Red concentric knob controls fine positioning of the horizontal CRT display.

l) X10 — Push-pull switch connected to the fine positioning control. In the extended position (out) the sweep rate is ten (10) times faster than indicated on the TIME/DIV switch. With the knob pushed in, normal X 1 sweep rates are obtained.

m) PROBE COMP — Tip jack provides a 4 volt P-P, 1kHz square wave for calibrating input probes.

3-9. DMM/COUNTER SECTION

a) AUX DMM INPUT — Mini banana jacks provide auxiliary input for the Kohm, ACV or DCV positions of the 4 position mode switch.

b) KOHM — Push-button switch puts the DMM in ohms measurement mode using the AUX DMM input connector.

c) ACV — Push-button switch puts the DMM in AC volts measurement mode using the AUX DMM input connector.

d) DCV — Push-button switch puts the DMM in DC volts measurement mode using the AUX DMM input connector.

e) SCOPE — Push-button switch puts the DMM in volt measurement mode. DC volts or AC volts is selected by CH 1 vertical input coupling switch (AC-DC-GND). Input to the DMM is the signal at CH 1 BNC connector. Input impedance is the scope input impedance, 1 megohm paralleled by approximately 30pf.

CAUTION: Remember that the DMM is part of the oscilloscope, and the oscilloscope signal low is chassis ground. Leaving the oscilloscope tied to ground and trying to use the AUX DMM inputs to measure a voltage not referenced to the same ground, will short the AUX DMM low lead to chassis ground.

When measuring a floating voltage with the AUX DMM leads, you must use the same procedure as used when floating an oscilloscope above ground.

f) COUNTER RANGE SWITCH (MHz-kHz) — Five push-button switch used to select the desired range for the counter. Full scale ranges are 10kHz (9,999Hz) to 50 MHz.

NOTE: The 975 counter displays the frequency of the signal used as the oscilloscope trigger signal, which can be INT-EXT,AC-DC, +/-. The oscilloscope display must be stable in order to obtain a meaningful reading of the counter. At high frequencies, the oscilloscope may appear to have a stable display but the counter will not be giving the proper readout. The TRIG LEVEL control should be used as a counter sensitivity adjustment to properly sync to the signal.

3-10. FIRST TIME OPERATION

The following procedure is provided to assist the operator in becoming familiar with the operational functions of the controls and to provide a practical operational procedure for testing the oscilloscope.

a) Inspect the power line input module for proper line voltage selection and proper fuse size. The voltage of operation for the oscilloscope, can be read on the printed circuit card inside the power receptacle block. This card is removeable and the operational volt-

age is readable in the left notch of the block. Connect the power cord to the receptacle and to a convenient power outlet. Depress the power switch and allow several minutes for the CRT to warm up.

b) Set the front panel controls as follows:

AC-DC-GND	CHANNEL 1-GND, CHANNEL 2-GND
VOLTS/DIV	CHANNEL 1-1V/DIV, CHANNEL 2-1V/DIV
Vertical Vernier	CHANNEL 1-pushed in, CHANNEL 2-pushed in
Vertical Position	CHANNEL 1-Midrange, CHANNEL 2-Midrange
NORMAL-INVERT	NORMAL
DISPLAY MODE	CH 1
TRIG SELECT	CH 1
Trigger Source	INT
Trigger Slope	+
Trigger Coupling	DC
LF REJ	Out
HF REJ	Out
TIME/DIV	.2mSec
Vernier	Pushed in
Coarse Horizontal Position	Midrange
Fine Horizontal Position	Midrange
X 10	Pushed in
TRIG LEVEL	Midrange
NORM-AUTO	Auto (pushed in)

If instrument is equipped with model 975 DMM/COUNTER:

KOHM-AC-DC-SCOPE	SCOPE
Counter Range	10kHz

c) Rotate the INTEN control until a horizontal line appears. Adjust the INTEN control, the FOCUS control and the ASTIG control for a suitable display.

d) Adjust Ch 1 Vertical Position for center screen display and Horizontal Position for sweep start at left edge of graticule.

e) Rotate the TRACE ANGLE control so that horizontal line is parallel to the graticule lines on the CRT.

f) Using the X1 probe, connect the Ch 1 Input to the PROBE COMP output.

g) Push the DC button on the Ch 1 Input Coupling switch. A four division square wave should appear on the CRT, with a frequency of approximately 1kHz. Push the AC button and the square wave should shift downward 2 divisions.

h) Rotate the Ch 1 Vertical Position control and observe that the display will move up and down on the CRT.

i) Rotate the Ch 1 Vertical Sensitivity switch CCW. The display will decrease in amplitude. Return to the 1V/DIV position.

j) Pull and rotate the Ch 1 Vernier control. The amplitude of the signal will decrease with CCW rotation. Push the Vernier back in at any point and the display will return to the calibrated position.

k) Connect the second probe, in the X1 position, to Ch 2 Input connector and connect it to the PROBE COMP output.

l) Press the CH 2 buttons on the DISPLAY MODE and TRIG SELECT switches. You will again observe a 4 division square wave on the CRT. Push the AC switch and the display should shift downward 2 divisions.

m) Rotate the Ch 2 Position control and verify that the display will move up and down on the CRT.

n) Rotate the Ch 2 Vertical Sensitivity switch CCW. The display will decrease in amplitude. Return to the 1V/DIV position.

o) Pull and rotate the Ch 2 Vernier control. The amplitude of the signal will decrease with CCW rotation. Push the Vernier back in at any point and the display will return to the calibrated position.

3-11. TRIGGER SELECT SWITCH

a) Place both Vertical Sensitivity switches to 2 V/DIV range. Place the DISPLAY MODE switch to ALT and the TRIG SELECT switch to MODE. Move the 2 POS controls so that the two square wave displays are separated. Adjust the TRIG LEVEL control, if necessary, to obtain a stable display of both signals.

b) Push the GND button on Ch 1 Input Coupling switch. The trace will dim slightly but the signal for CHANNEL 2 will remain triggered. Return to AC on Ch 1 Input Coupling switch.

c) Push the GND button on Ch 2 Input Coupling switch. The trace will dim slightly but the signal for CHANNEL 1 will remain triggered. Return to AC on Ch 1 Input Coupling switch.

d) Push the CH 1 button on the TRIG SELECT switch. Push the GND button on Ch 1 Input Coupling switch. The signal for CHANNEL 2 will now free-run and adjustment of the TRIG LEVEL control will not result in a stable display. Return to AC on Ch 1 Input Coupling switch.

e) Push the CH 2 button on the TRIG SELECT switch. Push the GND button on Ch 2 Input Coupling switch. The signal for CHANNEL 1 will now free-run and adjustment of the TRIG LEVEL control will not result in a stable display. Return to AC on Ch 2 Input Coupling switch.

NOTE: In the MODE position of the TRIG SELECT switch, the trigger signal is a combination of both CHANNEL 1 and CHANNEL 2. The signal is then controlled by the DISPLAY MODE switch in the following manner.

DISPLAY MODE Setting	Trigger Signal Origin
CH 1	Channel 1 only.
ALT	Alternating between Ch 1 and Ch 2.
ADD	Algebraic addition of Ch 1 and Ch 2.
CHOP	Algebraic addition of Ch 1 and Ch 2.
CH 2	Channel 2 only.
X-Y	Trigger signal disabled.

3-12. DISPLAY MODE SWITCH

a) Return to the MODE position on the TRIG SELECT switch and to CH 1 on the DISPLAY MODE switch.

b) The signal displayed now will be that on CHANNEL 1 only. This can be verified by moving Ch 1 Vertical Position control.

c) Push the ALT button on the DISPLAY MODE switch. The signal is now an alternating CHANNEL 1 and CHANNEL 2 display.

d) Push the ADD button on the DISPLAY MODE switch. The signal is now an algebraic addition of CHANNEL 1 and CHANNEL 2 and is twice as large as before.

NOTE: In the ADD mode of operation, the Ch 2 Vertical Position control is disabled and the display can be adjusted with Ch 1 Vertical Position only.

e) Push the CHOP button on the DISPLAY MODE switch. The signal is now a chopped display of the CHANNEL 1 and CHANNEL 2 signals. The chopper oscillator signal can be seen running through the horizontal portion of the two square wave displays.

f) Push the CH 2 button on the DISPLAY MODE switch. The display is now CHANNEL 2 only. This can be verified by moving the Ch 2 Vertical Position control.

g) Push the X-Y button on the DISPLAY MODE switch. This will result in a diagonal line from top right to bottom left. The X signal is applied to Ch 2 Input and the amplitude is controlled by Ch 2 Vertical Sensitivity switch. The X positioning is done by the Ch 2 Vertical Position control.

h) Move the Ch 2 Polarity switch to INVERT. The orientation of the line will change from top left to bottom right. This is due to the 180 degree phase shift of the CHANNEL 2 signal in the INVERT position.

3-13. TRIGGER AND HORIZONTAL CONTROLS

a) Disconnect the probes from the Ch 1 and Ch 2 Input connectors and the PROBE COMP tip jack. Push the CH 1 button on the DISPLAY MODE switch and the MODE button on the TRIG SELECT switch. Push the DC button on the Ch 1 Input Coupling switch.

b) Connect a sine wave generator to Ch 1 Input connector and set the generator frequency to approximately 1kHz. Set the amplitude control to obtain approximately full scale on the CRT. Adjust the TRIG LEVEL control until the sweep starts in the center of the display.

c) Using the DC offset control on the signal generator, move the vertical signal up or down on the CRT. Note that the sweep start point does not change in reference to the graticule.

d) Push the AC button on the Trigger Coupling control. Again, using the DC offset control on the signal generator, move the vertical signal up or down on the CRT. Note that the sweep start point now moves with the sine wave in reference to the graticule. Disable the DC offset control on the signal generator.

e) Push the Trigger Slope to the minus (-) position. The sweep start slope will change from plus to minus on the sine wave.

f) Rotate the TRIG LEVEL control. The sweep start point will ride up and down on the sine wave. The signal will free-run as the top and bottom peaks of the sine wave are reached.

g) Pull the TRIG LEVEL control knob out to the NORM position. Rotate the TRIG LEVEL control. The trace should disappear as you adjust to the top and bottom peaks of the sine wave. Reset the TRIG LEVEL control until the sweep starts in the center of the sine wave.

NOTE: In the NORM mode, the bright base line oscillator is disabled and the CRT will go dark until a signal is applied, of sufficient amplitude, to activate the trigger generator. At input frequencies at or below 40 Hertz, it will be necessary to use this mode in order to obtain a stable display.

h) Disconnect the signal generator from the Ch 1 Input and connect it to the External Trigger Input. Push the Trigger Source button to EXT. A line will appear on the CRT.

i) Return the Trigger Source switch to INT and the TRIG LEVEL control to AUTO. Reconnect the signal generator to Ch 1 Input.

j) Push the LF REJ filter in. Note that the amount of adjustment of the TRIG LEVEL control is very small to maintain a stable display. Return the filter to the extended position.

k) Set the signal generator frequency to approximately 500kHz and the TIME/DIV switch to luS range. Push the HF REJ filter in. Note that the amount of adjustment of the TRIG LEVEL control is very small to maintain a stable display. Return the filter to the extended position.

NOTE: The HF REJ and LF REJ filters are both single RC filters inserted into the trigger line. The LF REJ filter will start to attenuate at 16kHz and lower. The HF REJ filter will start to attenuate at 100kHz and higher. With both filters inserted, a bandpass filter between these two frequencies can be selected.

l) Rotate the TIME/DIV switch CCW and note that the amount of displayed sine wave cycles increases with each switch position. Set the TIME/DIV switch to the .2mS position. Set the signal generator to approximately 5kHz.

m) Pull and rotate CCW the Vernier control on the TIME/DIV switch. Note that the sweep time decreases and more sine waves appear within the graticule. Push the Vernier in at any position and the sweep rate will return to the calibrated position.

n) Note that there are 10 negative peaks of the sine wave displayed within the graticule. Pull the Sweep Magnifier control out, this is part of the Fine Horizontal Position control. There will be only one cycle of the sine wave displayed within the graticule. Push the Sweep Magnifier control back in.

o) Rotate the Coarse Horizontal Position control, the display will move horizontally on the CRT.

p) Rotate the Fine Horizontal Position control, the horizontal display will move 1 division for full travel of the control. This provides fine positioning in the expanded mode.

3-14. MODEL 975 DMM/COUNTER

a) Connect the X1 probe to Ch 1 Input connector and to the PROBE COMP tip jack. The DMM display will read approximately 2.00VDC.

b) Push the AC button on Ch 1 Input Coupling switch. The DMM will now read approximately 2.23VAC.

c) Connect the red DMM auxiliary input cable to the red AUX DMM mini banana jack. Connect the red probe to the PROBE COMP tip jack. Push the AC button on the DMM Mode Selector switch. The DMM will read approximately 2.23VAC.

d) Push the DC button on the DMM Mode Selector switch. The DMM will read approximately 2.00VDC. Disconnect the red probe from the PROBE COMP tip jack.

e) Push the KOHM button on the DMM Mode Selector switch. The DMM display will up-range and then start flashing. This flashing dis-

play is an over-range condition for the DMM and in the KOHM mode, it is normal.

f. Connect the red probe to the green AUX DMM mini banana jack. The DMM will now indicate .000.

NOTE: In the SCOPE mode of operation, the DMM is connected directly to Ch 1 Input. The input impedance is now the same as for the oscilloscope.

g. Connect the sine wave generator to Ch 1 Input. Adjust TRIG LEVEL control, if necessary, for a stable display. The counter will read out the frequency of the sine wave oscillator.

h. Move the signal generator to Ch 2 Input. The counter will now read 00.00.

i. Push the CH 2 button on the TRIG SELECT switch. The counter will now read the frequency of the sine wave generator. Note that you do not have a display on the CRT. Push the CH 2 button on the DISPLAY MODE switch. You will now have your display on the CRT.

NOTE: The signal that is driving the counter, is the output of the trigger generator. In order to have an accurate and reliable count, the trigger signal must come from CHANNEL 1 or CHANNEL 2. The TRIG LEVEL control must be adjusted for a stable display.

3-15. INPUT SIGNAL PROBES

When times 10X probes are used with the vertical inputs, they must be adjusted to compensate for the time constant of the input of each input. The PROBE COMP output may be used to provide the 1kHz square pulse signal. If you are using another square wave source, it is important to remember not to exceed a frequency of 1kHz, or the amplitude of the display will change while making the adjustment.

Since the DMM input is connected to CHANNEL 1, the input capacitance on CHANNEL 1 will be slightly higher than CHANNEL 2, it is recommended that the probes be labeled CH 1 or CH 2. This will make future probe compensations unnecessary unless the adjustment is moved.

3-16. CHANNEL 1 OR CHANNEL 2 OPERATION

The two channels may be operated as separate vertical amplifiers. Selection of display is controlled by selecting CH 1 or CH 2 on the DISPLAY MODE switch. The proper trigger signal can then be selected by the TRIG SELECT switch. In the MODE position, the trigger signal is controlled by the DISPLAY MODE switch. By pushing the desired position, the proper signal will be fed to the trigger generator.

Each channel has its own Vertical Sensitivity control (VOLTS/DIV) and its own Vernier. This switch is accurate when the Vernier is in the calibrated (pushed in) position. The Vernier allows for variable and overlapping adjustment of the Vertical Sensitivity.

The Input Coupling switch for each channel is used to select the mode of coupling desired, in the AC mode, the low frequency corner is about 2Hz. Do not exceed 400VDC + peak AC when this switch is in the AC mode.

3-17. ALTERNATE TRACE OPERATION

Dual trace operation is selected by pushing the ALT button on the DISPLAY MODE switch. In this position, the trace alternates between CHANNEL 1 and CHANNEL 2. In the MODE position, the timing relationship of the two signals cannot be determined due to the alternate switching of the trigger signal.

3-18. CHOPPED MODE OF OPERATION

In the chopped mode of operation, the electronic chopper oscillator operating at a frequency of about 1MHz, alternately selects CHANNEL 1 and CHANNEL 2 vertical signals and connects them to the vertical output amplifier. Each signal is alternately sampled for about ½ microsecond interval and displayed, as the trace sweeps horizontally across the CRT.

With the TRIG SELECT switch in the MODE position, the trigger signal is an algebraic addition of CHANNEL 1 and CHANNEL 2.

3-19. ADD MODE OF OPERATION

In the ADD mode of operation, CHANNEL 1 and CHANNEL 2 signals are algebraically added. To subtract CHANNEL 2 from CHANNEL 1, place the Ch 2 Polarity switch to INVERT. Only Ch 1 Vertical Position can be used in this mode since Ch 2 Vertical Position is disabled.

With the TRIG SELECT switch in the MODE position, the trigger signal will also be an algebraic addition. If the vertical signals are added, the trigger signals will be added. If the vertical signals are subtracted, the trigger signals will be subtracted.

3-20. X-Y MODE OF OPERATION

To activate X-Y operation, the X-Y button on the DISPLAY MODE switch is depressed. In the X-Y mode, normal Y signals are connected to Ch 1 Input and displayed on the CRT. The X signal is applied to Ch 2 Input. The CHANNEL 2 signal is connected to the horizontal amplifier. The Ch 2 Vertical Sensitivity control is used to control the X signal gain. Ch 2 Position is used to position the signal horizontally on the CRT. If the Ch 2 Polarity switch is placed to INVERT, the phase relation compared to CHANNEL 1, will be shifted 180 degrees. In this mode of operation, the trigger circuit, trigger generator and sweep generator are disabled.

3-21. HORIZONTAL DISPLAY

The horizontal time base is controlled by a 21 position rotary switch, a Vernier control and a X10 Sweep Magnifier. The calibrated ranges are selected by the rotary switch and the Vernier control allows these ranges to become variable by pulling out on the Vernier control. Rotation of the Vernier control allows for variable and overlapping ranges.

With the Sweep Magnifier in the X1 position (pushed in) normal sweep settings may be read directly from the TIME DIV switch. With the Sweep Magnifier activated (pulled out) these settings decrease by a factor of 10.

3-22. CRT CONTROLS

The intensity of the display is controlled by the INTEN control. The INTEN control should be set to a normal display when adjusting the FOCUS and ASTIG control. The FOCUS will change when the INTEN control set to maximum. The ASTIG is a screwdriver adjustment through the front panel. A sine wave display is best for adjusting the FOCUS and ASTIG control. The TRACE ANGLE control is a screwdriver adjustment through the front panel. This adjustment should be done with both vertical inputs grounded. Adjust the control until the horizontally displayed line is parallel with the graticule lines on the CRT.

3-23. BATTERY OPERATION

The battery pack version of the Model PS935 is operationally the same as the A C version with three minor exceptions.

a) The front panel Instrument Power switch is replaced with a green LED indicator light.

b) A three position rocker switch located on the right rear side panel controls power to the instrument. In the ON position the instrument is powered, and if the AC line is connected, the battery is recharged. In the OFF position no power is supplied to any portion of the instrument. In the CHG position power is supplied only to the battery charger.

c) Two mini-banana jacks are provided on the bottom of the instrument to supply external DC Power to the instrument (either in the form of the battery pack or an external DC source).

CAUTION: Do not reverse polarity to the EXT DC POWER jacks or the charger protection fuse will open, requiring replacement.

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